

- b) 225gm of soil was oven dried and placed in a specific gravity bottle and then filled with water upto a constant volume mark made on the bottle. The mass of bottle with water and soil is 1650gm. The specific gravity bottle was filled with water alone upto the constant volume mark and weighed. Its mass was found to be 1510gm. Determine the specific gravity of the soil. 04

Q-3

Attempt all questions

(14)

- a) Describe a hydrometer. Write the test procedure for hydrometer analysis of soils. Also mention the corrections to be made to the hydrometer readings. 07
- b) 500gm of soil was used for sieve analysis. The masses of soil retained on each sieve is given below. Plot a grain size distribution curve and compute the following: 07
- Percentages of gravel, coarse sand, medium sand, fine sand and silt as per IS 1498
 - Uniformity coefficient
 - Coefficient of curvature

Also, comment on the type of soil.

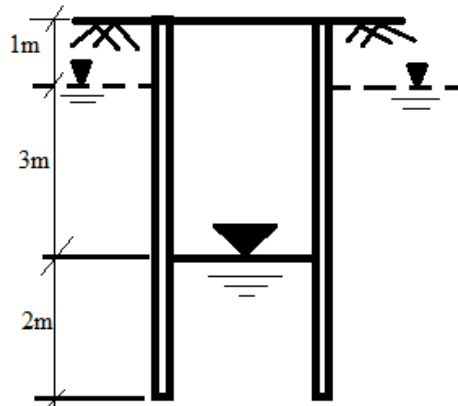
IS Sieve	2mm	1.4mm	1mm	500 μ	250 μ	125 μ	75 μ
Mass (g)	10	18	60	135	145	56	45

Q-4

Attempt all questions

(14)

- a) Explain the factors that affect permeability of soils. 06
- b) A trench is excavated in fine sand for a building foundation upto a depth of 4m. The excavation was carried out by providing the necessary side supports for pumping water. The water levels at the sides and the bottom of the trench are given in figure below. Examine whether the bottom of the trench is subjected to a quick condition if $G=2.64$ and $e=0.7$. If so, what is the remedy? 08



Q-5

Attempt all questions

(14)

- a) Explain the stress condition in soil due to surface tension forces. 06
- b) A recently completed fill was 10m thick and its initial void ratio was 1.0. The fill was loaded on the surface by constructing an embankment covering a large area of the fill. Some months after the embankment was constructed, measurements of the



fill indicated an average void ratio of 0.8. Estimate the compression of the fill.

- c) Draw pre-consolidation pressure curve. Write the steps to obtain pre-consolidation pressure from consolidation test results. 02

Q-6 Attempt all questions (14)

- a) Explain the types of consolidation occurring in soils. Mention why consolidation study shall be carried out for a site. 06

- b) A stratum of normally consolidated clay 7m thick is located at a depth of 12m below ground level. The natural moisture content of the clay is 43% and its liquid limit is 48%. The specific gravity of the soil particles is 2.76. The water table is located at a depth of 5m below ground surface. The soil is sand above the clay stratum. The submerged unit weight of the sand is 11kN/cum and the same weighs 18kN/cum above the water table. The average increase in pressure at the centre of the clay stratum is 120kN/cum due to the weight of a building that will be constructed on the sand above the clay stratum. Estimate the expected settlement of the structure. 06

- c) Derive relation between porosity and void ratio. 02

Q-7 Attempt all questions (14)

- a) A stratum of normally consolidated clay of thickness of 3m is drained on one side only. It has hydraulic conductivity of $k=5 \times 10^{-8}$ cm/sec and a coefficient of volume compressibility $m_v=125 \times 10^{-2}$ cm²/sec. Determine the ultimate value of the compression of the stratum by assuming a uniformly distributed load of 250kN/m² and also determine the time required for 20% and 80% consolidation. 07

- b) A mass of oven dried soil pat is 0.78N. When immersed in mercury the dry soil displaces 4.75N of mercury. If the specific gravity of soil $G=2.72$, what is the shrinkage limit of the soil. Assume the specific gravity of mercury as 13.6. 07

Q-8 Attempt all questions (14)

- a) Write on the pycnometer method for soil test. Draw the sketch of pycnometer. 06

- b) Write on the major soil deposits in India and also in the Gujarat region. 04

- c) Give valid reasons why geotechnical engineering is essential for civil works. 04

